

CONNECTICUT GreenGuide

SPRING 2015

100-YEAR OUTLOOK

Doosan plans to
succeed in fuel cells
where UTC failed

The New CT Commute

ECOMPANY

W. Hartford firm
runs energy
marathon

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COVER STORY

100-Year Outlook

After burning through two owners in two years, South Windsor's fuel cell manufacturing facility has been taken over by a South Korean conglomerate with a long-term vision.

PHOTO | STEVE LASCHEVER

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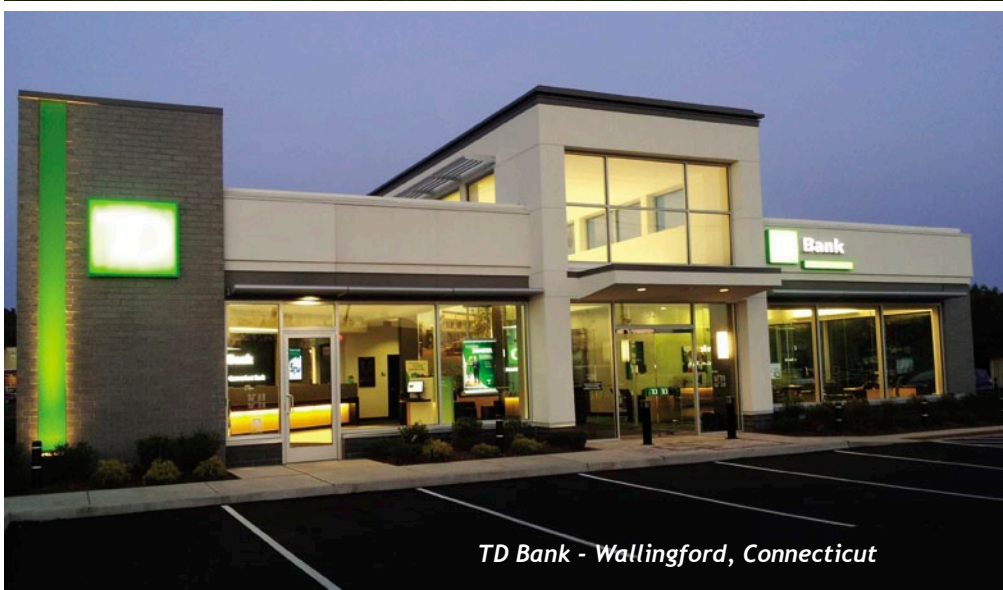
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On the Cover: Jeff Hyungrak Chung, CEO of Doosan Fuel Cell America, stands in front of a fuel cell stack at the company's South Windsor facility.

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CT Graduates

Let's call this Phase 2. Although Connecticut had a lot of programs going before Gov. Dannel P. Malloy took office, Phase 1 of turning Connecticut in a green business state started with the creation of the Green Bank, programs like C-PACE and renewable energy contracts, and the Comprehensive Energy Strategy.

Now, with all those balls in motion, it appears Connecticut is graduating to the next level.

As Michael Trahan notes in this issue's Advocate Corner (pg. 30), solar installers no longer view Connecticut as a fledgling market, but instead as a full-on market with real opportunities to make money.

The Connecticut Green Bank (pg. 7) is entering the next phase of its premier business program, Commercial Property Assessed Clean Energy, as the C-PACE director has left to launch the kind of private enterprise that government officials like Malloy said they wanted to start when they came up with all these initiatives.

The nearly 60-year-old fuel cell facility in South Windsor is having a rebirth (pg. 18). After its two previous owners lost interest waiting for the fuel cell market to materialize,



Brad Kane
Editor

Green Tip:

Once you've finished reading it, you can turn the Connecticut Green Guide into coasters for your office drinks.

the company appears to be on the upswing as a South Korean conglomerate with billions in resources sees the potential to be a market leader for the next 100 years.

Connecticut's transportation system will begin a new phase on March 28 when the CTfastrak busway between Hartford and New Britain opens (pg. 25). This comes as Malloy proposed a 30-year, \$110-billion transportation overhaul that starts by expanding rail services in New Haven, Fairfield, and Hartford counties.

Growing an industry from scratch takes slow, steady progress. While Connecticut certainly has pitfalls, its green initiatives keep moving forward. 🌱

Contributors

Solar Pricing

Opinion Columnist Jon Gordon tackles an issue certain to heat up during this year's state legislative session: how much residential solar owners should be paid for their excess power. See page **33**



Natural Gas Competition

News Columnist Lee Hoffman reveals how continuing problems with New England's natural gas pipeline capacity is limiting the ability of small suppliers to compete with utilities. See page **12**



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News Cycle

C-PACE Loses Architect, Enters Phase 2

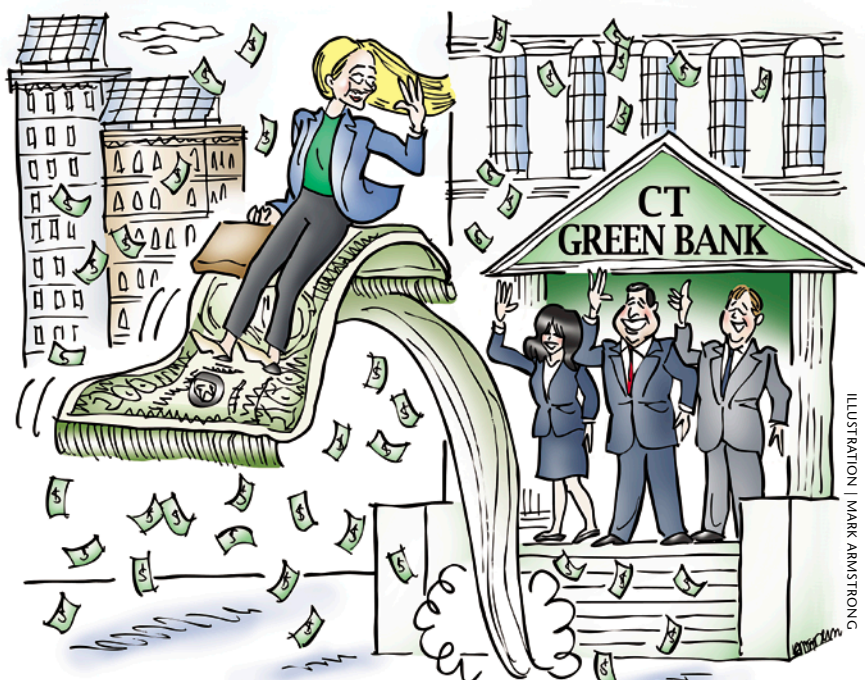
By Brad Kane

The person most directly responsible for the Connecticut Green Bank's premier business energy incentive program has left to start a similar private enterprise, leaving the organization to find a new leader as demand for the program rises.

Jessica Bailey and her team at the Green Bank transformed the Commercial Property Assessed Clean Energy (C-PACE) program from words on a legislative bill in 2011 to a fully functioning initiative that is highly regarded as the national standard for PACE programs around the country. In May 2014, the initiative became the first in the nation to receive private financial backing, scoring a \$30 million investment from the California-based Clean Fund to securitize PACE loans.

"We were fortunate enough to have Jessica Bailey, who had experience with PACE in other states," said Bryan Garcia, president and CEO of the Connecticut Green Bank. "Jessica understood the challenges other states faced, so we didn't have to relive those problems."

Bailey came to the Green Bank in 2012 from New York



City nonprofit Rockefeller Brothers Fund, which promoted clean energy programs like PACE around the country, so she saws the trials and tribulations similar programs faced.

When she took over as director of the C-PACE initiative, Bailey made sure to focus on the end users of the program — commercial and industrial building owners — knowing they would drive demand for the government



Paul Breglio, president of Crest Mechanical, said the C-PACE program will continue to be successful after Jessica Bailey left as long as it keeps the bureaucracy to a minimum.

PHOTO | CONTRIBUTED

▶ incentive dollars and eventually for private capital.

"The beautiful thing about PACE is it allows government to do what it does best in setting the rules and it allows private markets to do what they do best by scaling the program," Bailey said.

C-PACE works by providing long-term, low-interest loans to business property owners to make efficiency upgrades and install renewable energy systems. The hook is the annual payments on the loan are lower than the annual savings the property owners achieve by making the energy upgrades, so there is no extra cost to the property owner. The loan is tied to the property tax bill, so if the owner decides to sell the building, the next owner takes over payments.

Paul Breglio, president of Crest Mechanical, took out three C-PACE loans totaling \$740,000 to put solar systems on his buildings in Hartford and Norwich. Unlike typical government programs, Breglio said the process to get the loans and install solar was seamless.

"Jessica came to my office and talked to me, and she just cut through the red tape," Breglio said. "When I dealt with the C-PACE team, it was a breath of fresh air. It always seemed to go smoothly."

Through its first two years, C-PACE allocated \$65 million for more than 90 energy efficiency and renewable energy projects, including installing 6 megawatts of renewable energy. Because the program is tied to the property tax bills, Bailey and her team had to convince the state's cities and towns to voluntarily join the program. So far, 105 of the 169 cities and towns have joined, covering 90 percent of the commercial property in the state.

Much like the Clean Fund securitizing C-PACE loans, Bailey said now is the time for private enterprise to take over PACE programs, so government no longer has to provide the capital to make them function.

Since leaving the Green Bank at the end of January, Bailey has worked to start her private enterprise called Greenworks Lending. It will be a hybrid origination financing shop, sourcing capital for PACE projects around the country.

Right now she is building partnerships with private contractors and sourcing capital with attractive rates, along with doing typical startup activities, like picking a Greenworks brand and setting up a Web site.

"We are definitely in a slow build," Bailey said.

The Green Bank still is searching for a replacement to Bailey as the C-PACE director. Genevieve Rose Sherman has taken over as acting director and may get the permanent position, Garcia said, but he wants to have a strong competition among candidates for such an important position.

"Genevieve is incredible and has a lot of the same traits you saw in Jessica," Garcia said.

The C-PACE program received another \$40 million warehouse from the Green Bank board of directors to continue financing projects while the organization adds more private capital partners. Garcia said he is expecting more applications from businesses looking to install fuel cells and set up microgrids on their campuses.

"Ultimately, our goal is to have the private market out making deals with property owners and us getting out of the way," Garcia said. "At the end of the day, in order to solve the climate problem, we need more and more private investors because government can't do it all." 🍋

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GOVERNMENT WATCH

Malloy Eyes Massive Solar Investment Plan

Although the Connecticut General Assembly won't pass the massive energy and environmental overhauls that have been its hallmarks under the administration of Gov. Dannel P. Malloy, several proposals are working their way through the legislature this session that could have significant impact on



Gov. Dannel P. Malloy

industry if they are approved before the end of June.

Malloy has proposed a residential solar credit program similar to the Zero-emissions/Low-emissions Renewable Energy Credit program

(ZREC/LREC). This new Solar Home Energy Renewable Credit Program (SHREC) will offer owners of solar arrays on residential property 15-year contracts from the state utilities to buy the energy credits.

The governor hopes this new program – the successor to the current Residential Solar Investment program – will attract \$1 billion in private capital over its lifetime.

Other proposals under consideration at the legislature include capping the basic monthly connection fee for electric ratepayers to \$10, roughly half of what Eversource Energy customers pay now; allowing electricity suppliers to charge ratepayers only fixed-rate contracts, and no more variable rates; establishing a Long Island Sound Blue Plan to protect the resources along the coast; launching a regulatory study of the impacts of renewable energy programs on ratepayers. ●

SMART BUSINESS: JACKSON LABORATORY

JAX Lands \$1.2M Energize Incentive

To help its sustainability efforts, the Jackson Laboratory of Bar Harbor, Maine, received a \$1.2 million Energize Connecticut incentive for its new Farmington facility, which has since been certified LEED Gold.

Prior to construction of the Genomic Medicine lab in Farmington, which opened in October, Senior Facilities Director John Fitzpatrick worked with Hartford utility Eversource Energy to utilize Energize Connecticut programs and create a customized plan to reduce the lab's energy footprint. Eversource, along with Orange utility United Illuminating, administers the Energize Connecticut initiative.

The energy-saving measures implemented during construction of the 184,000 square foot building will save JAX Genomic Medicine more than \$620,000 a year on its energy bill.

The total cost of the efficiency portion of the project was roughly \$2.4 million, so after incentives covered half of that, the payback will be less than two years. That helped achieve the Gold level of the U.S. Green Building Council's Leadership in Energy & Environmental Design program.

"Working with Eversource, we were able to develop a plan and leverage the Energize Connecticut incentives into tangible actions that delivered a favorable return on investment," said Fitzpatrick. "The money we are saving can now be reinvested back into our operations in the form of new equipment and personnel with the promise to transform medicine and contribute to greater overall human health."

One of the most effective measures installed at the facility was a monitor-

Government Grades by Brad Kane

Transportation Overhaul – Gov. Dannel P.



Grade: C+

Malloy's failure to identify a funding source for the spending left his pitch a little flat. It's OK, governor, you can say, "Tolls." It won't kill you.

Malloy went big with his proposed budget this year, calling for a \$110 billion, 30-year investment to make the state's transportation infrastructure a true intermodal system.

Strong leadership was needed on this, but

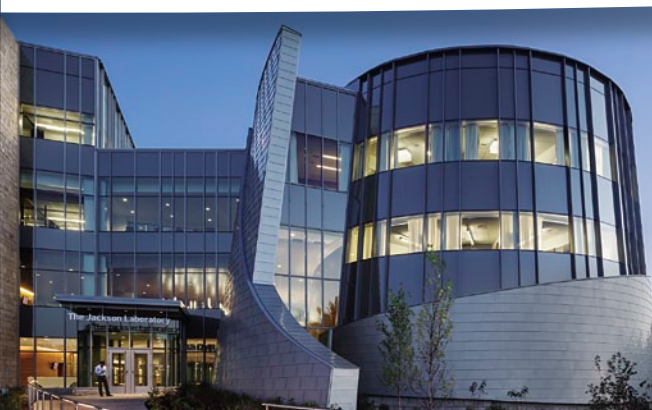


Grade: A-

connecticut, Massachusetts, and Rhode Island came together to use their collective buying power to pay for significant renewable energy installations.

Renewable Teamup –

Picking up the failed pieces of the plan to have all New England states work together to address the region's energy issues, the governors of Con-



JAX will earn back the money spent on its energy upgrades in less than two years, thanks to incentives and increased efficiencies.

PHOTOS | CONTRIBUTED

ing system from Massachusetts vendor Aircurity used to regulate ventilation throughout the labs. For climates like Connecticut's where it is cold in the winter and hot and humid in the summer, an Aircurity system reduces the amount of outside air required to provide safe ventilation rates in the facility, therefore minimizing the amount of energy to heat or cool the building.

Standard occupied ventilation rates typically call for air to be refreshed every five minutes (12 times per hour). JAX Genomic Medicine's Aircurity system is so effective that laboratory air only has to be refreshed every 15 minutes, or four times per hour, an energy savings of 66 percent compared to standard control systems.

Other energy efficiency measures include pipe and duct insulation, energy saving light bulbs and occupancy sensors, high efficiency air handling and control systems, and customized water cooling technology.

"JAX Genomic Medicine is a great example of how ... commercial and industrial customers achieve bottom line savings, even before the shovels hit the ground on a new construction project," said Enoch Lenge, energy efficiency spokesperson at Eversource.

The lab is expected to save approximately 3 million kilowatt hours of electricity and more than 2,800,000 cubic feet of gas each year. 🌱



Grade: A

between New Britain and Hartford on March 28. Malloy is taking it one step further by proposing an expansion east to Manchester.

CTfastrak – After decades of back-and-forth on the need for more public transit, the Connecticut Department of Transportation is rolling out its express busway, CTfastrak,

Blumenthal Rejection – After the Public Utilities Regulatory Authority approved raising the power grid connection fee from \$16 to \$19.25 monthly for Eversource Energy's customers, Sen. Richard Blumenthal (D-CT) wrote a letter to the Federal Energy Reg-



Grade: F

tory Commission calling PURA horrendous and asking for an investigation, which was denied. Don't sling mud at state regulators to win political points.

By the Numbers

240,798

Gallons of paint recycled in the first year of Connecticut's stewardship program.

\$3B

Purchase price for Spanish utility giant Iberdrola to buy New Haven-based UIL Holdings, creating a U.S. company with 3.1 million customers.

\$480M

Amount the State Bond Commission approved for wastewater projects in Hartford, Bristol, Norwich.

Feb. 2, 2015

Date Northeast Utilities changed its name and the name of all of its subsidiaries (including Connecticut Light & Power and Yankee Gas) to Eversource Energy.

3

Years of probation that Thomas Faria, former CEO of New London's Sheffield Pharmaceuticals, received for discharging wastewater without a permit.

\$3.1M

Amount asked for in lawsuit filed by Connecticut Innovations over a loan made to Jim Barnes, the former head of Oakleaf Waste Management, for a wind turbine company. A settlement is near.

SOURCES: PAINTCARE, UIL, STATE BOND COMMISSION, EVERSOURCE, U.S. DEPARTMENT OF JUSTICE, CONNECTICUT SUPERIOR COURT



(Left) Crews from Yankee Gas install a pipe to serve the home heating distribution system. The gas for that system comes from the pipeline transporting it into Connecticut. (Right) The rise in the drilling of natural gas in America has decreased the cost of the commodity, but difficulty in transporting it to New England has kept the region from experiencing the full benefits. PHOTOS | HBJ FILE

Capacity Shrinking Natural Gas Competition

By Lee D. Hoffman

More than 10 years ago, Connecticut, like other states, embarked on opening up its natural gas markets to competition, in the hope of offering more contracting options. While residential consumers



of natural gas must still buy their gas from a regulated utility such as Eversource, Connecticut Natural Gas, or Southern Connecticut Gas, industrial and commercial customers have the ability to purchase their natural gas from a competitive supplier of their choosing, at least for the time being. According to the competitive suppliers, however, the window may be closing on Connecticut's competitive gas markets.

Competitive natural gas supply works much the same as competitive electric supply in Connecticut. Essentially, a business owner selects the company that will sell it the natural gas, much as businesses and residential consumers select what company will sell them

their electricity. The regulated utilities charge a fee to transport that gas to the business, much as electric utilities charge to distribute the electricity to customers.

With both electricity and natural gas, customers may choose to have both the supply and distribution provided by the utilities. Because the utilities are heavily regulated, however, they are restricted as to how they can purchase such resources, and they may not always be able to get the best price for consumers. Allowing competitive suppliers allows for the potential of lower prices and more contracting options.

Unlike the electricity market, however, the natural gas distribution system in Connecticut is currently constrained, meaning that during periods of heavy usage (such as cold winters), there is limited capacity available on the gas pipelines. The Public Utilities Regulatory Authority (PURA) addressed this issue 10 years ago when it provided a limit on pipeline capacity of 25 percent to the competitive suppliers, so that the utilities would have sufficient resources for reliability with the remaining 75 percent.

Recently, the competitive suppliers alerted PURA that



Power plants that run on natural gas, like the NRG Energy facility in Middletown, also draw the fuel from the pipeline, limiting the capacity for home heating.

PHOTOS | HBJ FILE

this method of allocating capacity is having the unintended consequence of driving up competitive prices due to the increased costs of scarce capacity. Between the scarcity of capacity and the cost allocations for capacity charged by the utilities, the suppliers have informed PURA that unless changes are made to the program, the competitive suppliers will no longer be able to cost-effectively supply gas to their customers and take on the risks of the market. The suppliers' suggested solution is rather than having an artificial capacity allocation between competitive suppliers and regulated utilities, the capacity should serve the customer purchasing the gas, regardless of who that customer purchased the gas from.

The utilities have countered that allowing such a capacity-follows-the-customer allocation may cause unreliability in the gas distribution system, since the utilities will never be truly certain how the capacity resource will be allocated at any given time.

This matter is currently before PURA, and it is hoped that PURA will issue a decision before customers need to be signed up for the next heating season. Only time will tell if Connecticut's experiment with competitive natural gas supplies will be allowed to continue, or whether the capacity constraints that Connecticut faces will suffocate the competitive suppliers. 🍃

Lee D. Hoffman is chairman of Hartford law firm Pullman & Comley's Regulatory, Energy, & Telecommunications Department.

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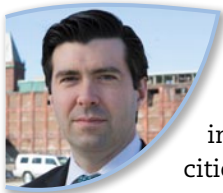


Reusing Properties

Connecticut's brownfield program picks up in 2015

By Tim Sullivan

Since Dannel P. Malloy became governor, the remediation and redevelopment of contaminated and abandoned properties — better known as brownfields — has become a centerpiece of the state's economic development agenda.



Since fiscal year 2012, Connecticut has invested more than \$110 million in redeveloping brownfields in every corner of the state, in big cities and small towns. It's not just the state who is investing — for every dollar invested by the state in these projects, non-state partners (primarily the private sector) have invested \$3.43. To put this in perspective, the U.S. Environmental Protection Agency's brownfield program is estimated to have invested a total of just \$190 million nationwide since the program's inception in 1995. In 2014 alone, the

Connecticut Department of Economic & Community Development awarded more than \$35 million of funding to 55 new projects.

This year is already off to a fast start. In January, Malloy announced that \$2.2 million of grants had been awarded to eight historically significant brownfield sites throughout the state, allowing these structures to take crucial steps toward preservation and redevelopment. This spring, DECD will accept applications for a new round of grants, as well as continuing to accept loan applications.

We expect to see continued progress at priority project sites, such as the Contract Plating site in Stratford, where remediation work funded by a \$3 million state grant has begun at a former metals manufacturing facility, and at the Amerbelle Mill in Vernon, where a \$2 million state grant is helping bring hundreds of new jobs that will revitalize downtown Rockville.

In New Britain, demolition will begin on the former police station, opening up that site — located just across

◀ Northeast Neighborhood Partners received a \$1 million DECD loan to revitalize the former Swift Factory in Hartford. The city is pursuing a federal Promise Zone declaration for the neighborhood -- a program designed to clean up blighted areas -- that would help the nonprofit restore the property.

PHOTO | HBJ FILE

the street from the CTfastrak station — for transit-oriented development. In Hartford, a leading nonprofit group will continue to stabilize and restore the Swift Factory — which once made the gold leaf that adorns the State Capitol — into a community-driven hub of food manufacturing, healthcare, and sustainable technology.

Absent this public investment, these sites would continue to languish as blights on their surrounding communities. Instead, these former eyesores are now being reimagined as new businesses, new homes, new open space, new cultural resources, and in some cases even new urban agricultural land. Brownfields are having second acts as economic engines. Every acre of brownfields that can be redeveloped is an acre of job-creating development that doesn't consume precious green space or farmland. Brownfields leverage existing infrastructure like sewers, water, energy, and transportation. Investing in brownfields pays multiple dividends.

Despite this historic commitment of state resources, the challenge facing the state remains daunting — there are thousands of contaminated legacy industrial sites throughout the state where redevelopment faces significant technical and financial challenges. So in 2015, DECD and our partner, the Department of Energy & Environmental Protection (DEEP) will continue to prioritize brownfield revitalization with a goal of returning the most promising of these sites to productive use as quickly and efficiently possible.

Connecticut's brownfields are a legacy challenge left behind by the past — but with concerted investment and focus, they can be converted from liabilities into assets that will fuel the state's future. 🍃

Tim Sullivan is the deputy commissioner of the Connecticut Department of Economic & Community Development.

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HIGHLIGHTING THE ACHIEVEMENTS
OF AREA BUSINESS LEADERS

Sisson succeeded Michael McQuade, UTC vice president for science and technology, on the board of directors for the Alliance to Save Energy.

Connecting Business & Technology

By Kathryn M. Roy

Sustainability may be the buzzword of the 21st century, but William Sisson has been bridging the gap between technological advancements and business interests for two decades.

"He has been stalwart in getting business leaders to think big about reducing energy waste and not be satisfied with a few short-term or incremental gains," said Uwe Brandes, executive director of the Urban and Regional Planning Program at Georgetown University, who works with Sisson on business efficiency initiatives.

Sisson, recently elected to the board of directors for the Alliance to Save Energy, a Washington, D.C.-based national nonprofit organization, said energy efficiency and

LOCATION: East Hartford

TITLE: Director of Sustainability

COMPANY: United Technologies Research Center

STARTED WITH UTC: 1985

WEB: www.utrc.utc.com

INFO: Sisson has received degrees from Virginia Tech, Rensselaer Polytechnic Institute, and the Massachusetts Institute of Technology. He has been an MIT Sloan Fellow since 1999.

▶ sustainability play an even more critical role today.

"It's really important — even more so today than 20 years ago — for us to have a greater national awareness on energy and what it means for national security and energy security for the next 100 years," Sisson said.

Sisson said he is honored to serve on such a prestigious board and will have the opportunity to represent his business interests for UTC and his professional interests with the alliance board. Over the last 10 years, Sisson has played an important role in bringing some of the knowledge and awareness of what's happening in global sustainability to UTC executives.

"It's a unique role I've been able to play bridging between the technology organization that I sit in and having the opportunity to explore things important to the strategic direction of the company," Sisson said.

Sisson also serves as UTC's liaison delegate to the World Business Council for Sustainable Development, an organization of some 200 global companies.

"Some of them are peer companies, but we come together and talk about sustainability and what it means to our businesses and our agenda," Sisson said. "It really gives me access to a broad global network."

Brandes has worked with Sisson in several industry-based research initiatives focused on advancing best business practices in local urban economies. Brandes said Sisson is a global leader in advancing the economic benefits that organizations and their local communities can capture through a holistic embrace of energy efficiency measures.

"His work is of extreme consequence to communities around the world, as local leaders seek to mitigate and adapt to long-term trends associated with climate change," Brandes said.

Sisson is pleased with how far businesses have come but sees this as only the beginning of a true shift in how businesspeople think.

"It's about increasing awareness...raising consciousness," Sisson said. "We have a long way to go, but UTC's in it for the long run. I'm not done yet; I'm just getting started." 🍋

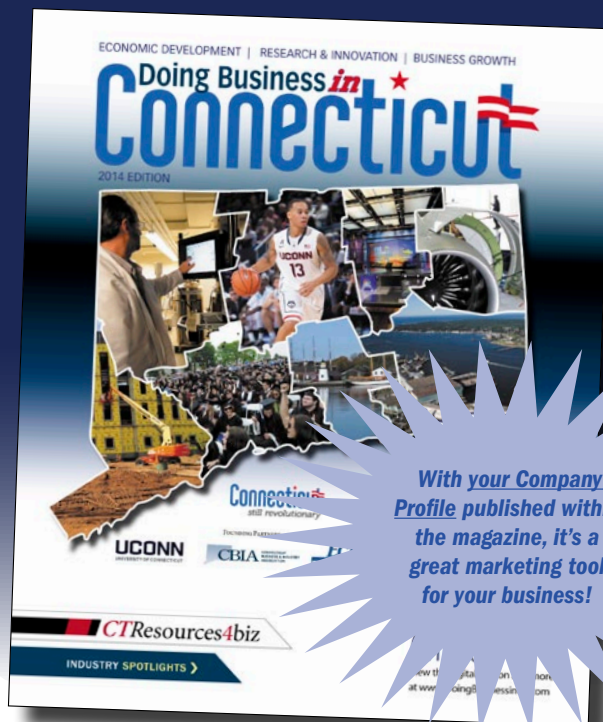
Green Fact:

The buildings in which we live, work, and play are responsible for upwards of 40 percent of the world's energy consumption.

SOURCE: UTC

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100-Year Outlook

Doosan looks to succeed where UTC failed

By Brad Kane

Where Hartford conglomerate United Technologies Corp. saw only lost revenue and science projects, South Korean conglomerate Doosan sees opportunities.

Doosan has taken up residence in the old fuel cell facilities of UTC Power in South Windsor, having saved the company off the auction block in July. Since that time, the company — officially dubbed Doosan Fuel Cell America — has grown from 36 employees helping with the transition to nearly 200 today, with another 100 employees to be added by the end of the year. ▶

Jeff Hyungrak Chung sees fuel cells as an important part of the future energy infrastructure, especially as businesses want to have their power generated locally.

PHOTO | HBJ FILE

Technological Differences

While the basics of all fuel cells are the same, companies use different technologies to produce electricity in the chemical process.

COMPANY	FuelCell Energy	Doosan
TECHNOLOGY	Carbonate	Phosphoric Acid
ESTIMATED POWER OUTPUT	300kw-2.8MW	400kw
TYPICAL CUSTOMERS	Utilities, Large Industrial	Commercial Buildings
FUEL	Natural Gas, biogas	Natural Gas
RECOVERS WASTE HEAT?	Yes	Yes

SOURCE: FUELCELL ENERGY

► This comes in stark contrast to the previous two years for the South Windsor fuel cell facility, where small California firm ClearEdge Power — who took over in 2013 after UTC gave up trying to make it profitable — struggled to maintain its revenues and keep its workers employed before bottoming out in April by laying off its entire workforce and declaring bankruptcy.

“The difference that Doosan has, we don’t think about this on a year or two-year basis,” said Jeff Hyungrak Chung, CEO of Doosan Fuel Cell America. “If we believe there is a market opportunity, that is the sustaining factor.”

Former UTC CEO Louis Chenevert saw fuel cells as an unprofitable divi-

Hartford’s Gold Building, headquarters of United Technologies Corp., original owners of the South Windsor fuel cell firm.

PHOTO | HBJ FILE

sion that didn’t align with the conglomerate’s aerospace and building system products. ClearEdge’s chief investor Jim Kohlberg waived in his support of the technology before finally pulling the plug, leading to the sudden layoffs. Doosan CEO and Chairman Yongmaan Park sees fuel cells as the future of local power grids and wants to get his conglomerate in on the ground floor, Chung said.

“The key difference is Doosan has made the commitments,” Chung said. “This is a top priority for our top management.”

UTC and former ClearEdge management declined to be interviewed for this article.

Doosan is not listed on any stock exchange, so its leaders aren’t beholden to quarterly returns or analysts, Chung said. Park prefers to think about where the company needs to be over the next 100 years, and that includes being at the forefront of the fuel cell market.

The acquisition of UTC’s former fuel cell assets is the latest move in Doosan’s transition from a consumer-based company to an industrial conglomerate. Back in 1997, South Korea suffered through an Asian



History of Doosan Fuel Cell America

1958: East Harford jet engine maker Pratt & Whitney starts a fuel cell division

1966: The division begins supplying fuel cells for NASA space missions

1985: The division becomes a wholly owned UTC subsidiary, named International Fuel Cells

1990s: The company begins developing fuel cell power plants

2001: The company is renamed UTC Power

February 2013: Taking \$227 million in charges, UTC unloads the subsidiary onto ClearEdge Power

April 2014: ClearEdge lays off all its workers, files for bankruptcy in May

July 18, 2014: Doosan agrees to buy firm off auction block for \$32.4 million

SOURCES: UTC, U.S. SECURITIES & EXCHANGE COMMISSION, DOOSAN

Jeff Hyungrak Chung

CURRENT TITLE: CEO of Doosan Fuel Cell America, based in South Windsor

CURRENT LOCATION: South Windsor

IMMEDIATE PAST POSITION:

Chief Strategy Officer of
Doosan Heavy Industries

IMMEDIATE PAST LOCATION:

South Korea

DEGREES: Bachelor’s from Harvard, master’s in economics from Brown University

SOURCE: DOOSAN



Green Fact: The first fuel cell was invented in 1838 by Welsh physicist William Grove.

SOURCE: THE LONDON AND EDINBURGH PHILOSOPHICAL MAGAZINE AND JOURNAL OF SCIENCE.



(Left) Kent McCord is one of the few remaining Doosan employees who also worked for ClearEdge and UTC Power. (Right) The technology for the fuel cells made by FuelCell Energy differs from the Doosan technology, with FuelCell's designed for larger applications. PHOTO | HBJ FILE

► financial crisis, and Doosan — with lines of revenue like being the

country's Coca-Cola bottler — felt the pain on its bottom line.

Over the last 10 years, the company has invested in businesses like large-scale infrastructure and equipment while becoming less reliant on its domestic market. Doosan, for example, has built every nuclear power plant in South Korea, but more than 55 percent of its worldwide employees are not Korean.

The company purchased the ClearEdge assets for \$32.4 million because the need for clean energy is not going away, and fuel cells offer a way for communities to generate electricity locally, rather than relying on massive, far-off power plants, Chung said.

"This is the first time we are making an investment where we are thinking about the next growth engine," Chung said. "It is somewhat related to what we have

done in the past, but it is a new area for us."

Unlike ClearEdge, which was a small company that struggled with cash flow, Doosan will be an excellent fit for the South Windsor fuel cell facilities, said Joel Rinebold, director of energy initiatives for the Connecticut Center for Advanced Technology. Fuel cells align with Doosan's experience power plants, construction, and supplying large industrial equipment.

"They know where they area at, and they know where they want to be, and they have the resources to get there," Rinebold said.



Chip Bottone, CEO, FuelCell Energy

The first step in making the fuel cell subsidiary profitable is to make its product competitive, including improving the technology, Chung said. Second is developing the market opportunity, and third is creating a corporate culture that can support the business sustainably.

South Korea already is the largest fuel cell market in the world, and

Three Owners in Two Years: South Windsor's Fuel Cell Operators

	DOOSAN	UTC	CLEAREDGE POWER
HEADQUARTERS:	Seoul, South Korea	Hartford	Sunnyvale, Calif.
FOUNDED:	1896	1975	2003
ANNUAL REVENUES:	\$26B	\$65B	\$100M
EMPLOYEES:	43,000	211,500	250
PRIMARY PRODUCTS:	Power Plant Construction, Heavy Machinery	Aerospace Components, Building Systems	Household Fuel Cells
CEO:	Yongmaan Park	Gregory Hayes	David Wright

SOURCES: UTC, DOOSAN, CLEAREDGE



(Above) ClearEdge Power's employees were given less than one-day's notice when they were laid off in April. (Right) A Doosan crew installs the fuel cell at 777 Main St. in Hartford.

PHOTO | HBJ FILE

while Doosan makes use of its home-field advantage there, Chung said, the company also plans on stepping up sales in the United States — the second largest fuel cell market. Longer term, the company is eyeing South Africa and European countries like England and Germany.

Danbury's FuelCell Energy, which is the largest fuel cell producer in the world with \$188 million in revenue last year, is on the verge of becoming the first fuel cell company to turn a profit because the worldwide market is growing and the firm already has done the heavy lifting to ramp up its production volume to meet rising demand, said CEO Chip Bottone.



David Wright,
former CEO,
ClearEdge Power

Bottone said he isn't worried about Doosan raiding FuelCell's business — especially in South Korea, which is FuelCell's largest market — because FuelCell offers bigger, more affordable products built for the utility industry and large industrial customers.

"There may be jobs that overlap, but we won't lose those jobs," Bottone said.

The first customer for Doosan after it took over the South Windsor facility was Fairfield developer Bruce Becker, who purchased a 400-kilowatt fuel cell for his apartment complex at 777 Main St. in Hartford. Becker originally ordered the fuel cell from ClearEdge, but even though Doosan hasn't gotten its production fully operational yet, the company was able to deliver one to Becker because it was one of the few completed fuel cells that remained after ClearEdge went bankrupt.

Becker ended up paying more for the fuel cell than



Green Tip: Connecticut's LREC program to provide 15-year renewable energy credit contracts to businesses installing fuel cells expires in 2017.

he would have under ClearEdge, but he was happy to finally get one delivered to his Hartford development after all the volatility in South Windsor.

"It is a great company and a great product, and I'm glad they are keeping going," Becker said. "Eventually, they will become less expensive once they start producing more of them."

Chung said Doosan Fuel Cell America will remain well-connected to the local community, but plans to leverage the assets of its 119-year-old global parent in order to become a profitable division and a force in the fuel cell industry.

"We do have aggressive plans," Chung said. 🌱



Marathon Energy

John A. Lahtinen

Legrand has spent hundreds of thousands of dollars and entire days trying to reduce its environmental impact, but last October, the building systems manufacturer decided a marathon was in order.

As part of its participation with the U.S. Department of Energy's Better Buildings Challenge, Legrand devised and unveiled an Energy Marathon, a 26.2-day competition to reduce energy consumption across Legrand North America sites.

"It's the kind of creative solution we love to see from our partners, and a great demonstration of how people power, or changing behavior, can have just as big of an impact as equipment upgrades on lowering

HEADQUARTERS: West Hartford

YEAR FOUNDED: 1984
(first U.S. location)

EMPLOYEES: 30,000 worldwide

WEBSITE: www.legrand.us.

INFO: In addition to improving its energy performance, Legrand has set long-term goals to significantly reduce its water consumption and to totally eliminate its waste to landfills.

Legrand has 30,000 employees worldwide and generates \$5.8 billion in revenue.

energy use and greenhouse gas emissions,” said Maria Vargas, the Energy Department’s director of the Better Buildings Challenge.

The marathon was created in part due to the success of Legrand’s own Power Down Day held in November 2012, which challenged employees across all sites to reduce energy consumption by as much as possible in a single day.

“The results were pretty dramatic and the competition created quite a buzz across the company,” said Susan Rochford, vice president for energy efficiency, sustainability and public policy for Legrand North America. “We had fun, we’d raised awareness, and we saved energy. But a one-off event is not sufficient if the goal is to achieve lasting energy behavior change.”

For the marathon, each Legrand site captured a baseline reading of electricity consumption on the same day and same time last September from which the company could measure energy savings from Oct. 1-27. The winning site reduced energy consumption by 63 percent and the company overall reduced energy consumption by 15.5 percent and saved \$47,000 in energy expenses.

“Legrand is sharing lessons learned from its experience with the marathon so that other companies can host similar events,” Vargas said.

Since 2011, Legrand has participated in the Better Buildings Challenge, an initiative launched by President Barack Obama that supports a goal of doubling American energy productivity by the year 2030 while at the same time motivating corporate and public sector leaders to save energy.

Legrand committed 14 sites to the challenge, pledging to reduce its energy intensity by 25 percent in 10 years. By the third year at the end of 2013, the company already had reduced its intensity 32 percent compared to the baseline set in 2009, said Rochford.

Because of that early success, the company setting a further goal of another 25 percent intensity reduction by 2022. 🍋

Green Fact:

Legrand saved enough energy during its Energy Marathon to drive the Chevy Volt strictly on battery to the Moon and back 3.3 times, or enough to drive around the Earth 63.8 times.

SOURCE: LEGRAND

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Jumping on Board

Bus, rail projects aim to change the way the state commutes

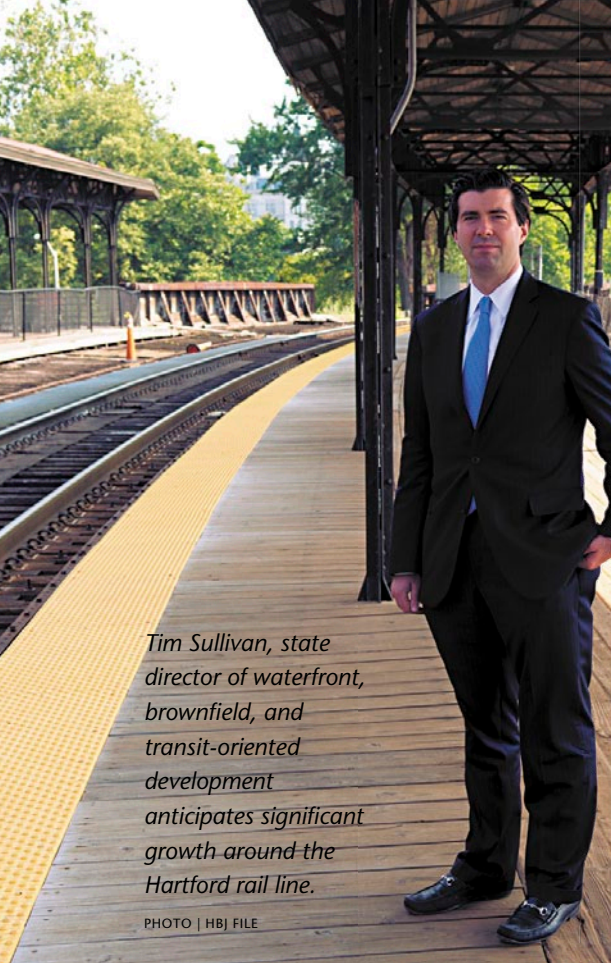
By Katie Bucaccio

Commuting in Connecticut often means getting stuck: stuck in traffic congestion on I-84 or I-95, stuck during delays on the Metro-North, stuck waiting for CT Transit buses in Hartford.

This year, however, the state is making big strides to get more commuters on the move. The Connecticut Department of Transportation has multiple projects in the works, representing a shift in focus away from highways and bridges ►

Joe McGee, vice president of public policy and programs at the Business Council of Fairfield County, has advocated for improvements to the New Haven Line in order to relieve congestion on I-95.

PHOTO | HAROLD SHAPIRO



Tim Sullivan, state director of waterfront, brownfield, and transit-oriented development anticipates significant growth around the Hartford rail line.

PHOTO | HBJ FILE

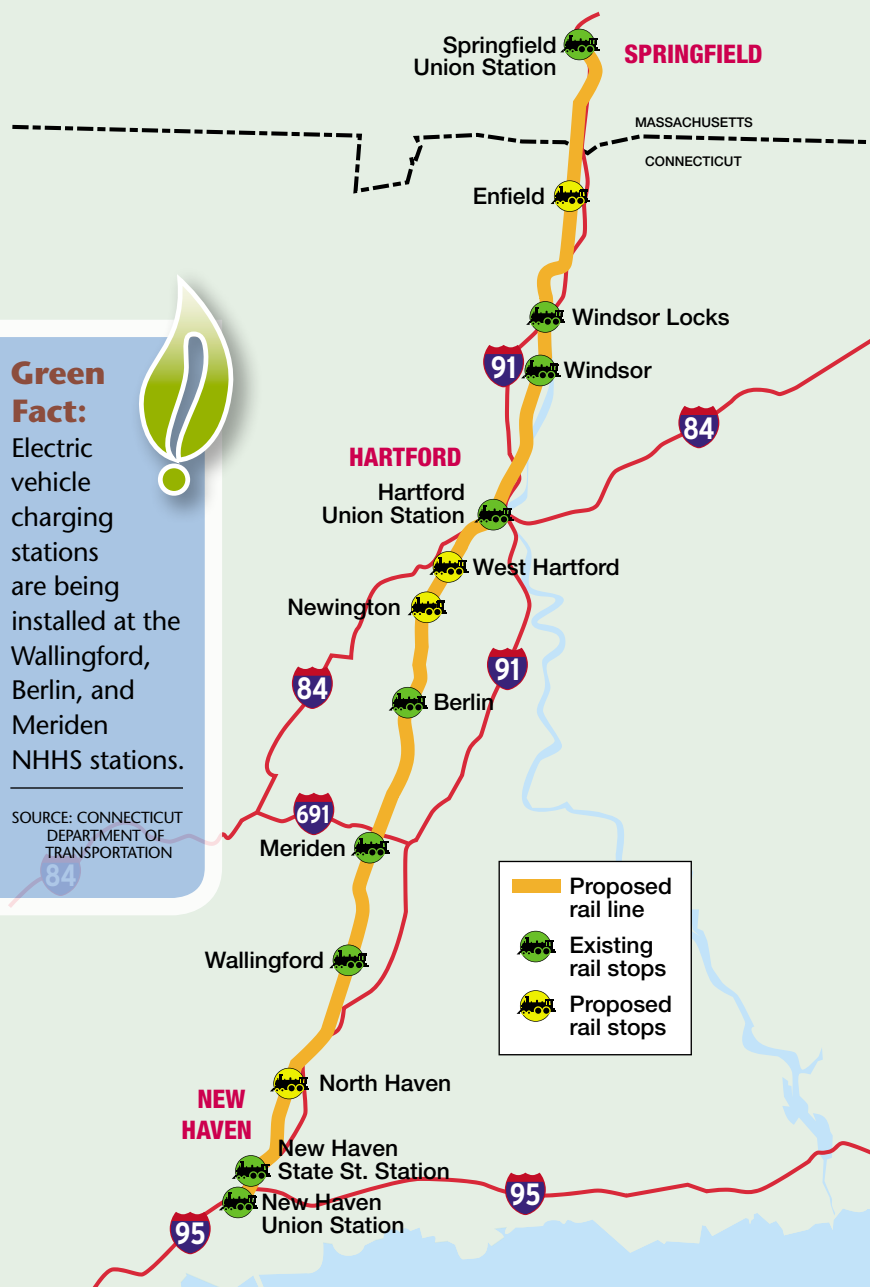
State Stations

Train stations are being built and improved across the state

HARTFORD LINE: New stations in the works for Enfield, West Hartford, Newington, and North Haven. Enhancements are being made to existing stations in Windsor Locks and Windsor, and a location study is being conducted for a future Hamden station.

NEW HAVEN LINE: New stations will be added in Orange and Bridgeport (to be known as Barnum Station), plus enhancements to the existing Merritt Seven Station on the Danbury branch.

SOURCE: CT DEPARTMENT OF TRANSPORTATION | MAP: HBJ FILE



Green Fact:

Electric vehicle charging stations are being installed at the Wallingford, Berlin, and Meriden NHHS stations.

SOURCE: CONNECTICUT DEPARTMENT OF TRANSPORTATION

Job Creator, Energy Reducer

The Hartford Line will have a big impact, both economically and environmentally

Job creation

- Direct and indirect jobs created: 8,000
- Construction-related jobs: 4,500

Energy Savings

- More than 100 million fewer vehicle miles driven each year by 2030
- More than 3.5 million gallons per year of fuel saved
- More than 25,000 metric tons less carbon released per year

SOURCE: CT DEPARTMENT OF TRANSPORTATION



McGee believes the new train stations in Orange and Bridgeport, will make it more convenient for commuters to use alternatives to cars.

PHOTO | HAROLD SHAPIRO

► and towards mass transit and getting cars off the roads.

However, public opinion about the projects has not been promising. Take the first project that will be up and running — the 9.4-mile busway from New Britain to Hartford known as CTfastrak. The bus rapid transit solution caused controversy over its 15 years of development, as many questioned whether the \$567 million price tag was the best source of federal grant money and taxpayer dollars. An increasing desire statewide for carless travel, however, has helped to quell those concerns.

“It used to be a big joke, like, ‘Why did we buy Alaska?’” said Joe McGee, vice president of public policy and programs at the Business Council of Fairfield County. “It’s going to be very important for

Hartford, but most people don’t realize that yet.”

The busway is scheduled to take its inaugural ride on March 28. The prospect of using the low-emission hybrid diesel-electric buses has managed to become popular among the likes of Central Connecticut State University students, who will be able to travel around the area without bringing a car to campus. The DOT is even looking to expand the service east in the future to UConn.

“When I got to Connecticut, [the busway] probably had the worst reputation of any project I’d ever seen,” said DOT Commissioner Jim Redeker, who joined the department in 2008. “Now, it’s like the area is getting a whole new lease on life when it comes to transportation.”

With CTfastrak, central Connecticut is getting its first meaning-

ful mass transit system, said Tim Sullivan, state director of waterfront, brownfield and transit-oriented development at the Department of Economic & Community Development.

Comparatively, the shoreline is miles ahead of Greater Hartford in when it comes to public transit, running the busiest commuter railway in the country, the Metro-North New Haven Line, but the overworked line has had its challenges of late.

Last summer, McGee had a firsthand experience getting stuck. He was riding on the New Haven Line on one of the two occasions last year when the 118-year-old Walk Bridge over the Norwalk River failed to open, resulting in massive delays. The DOT is now embarking on a \$465 million bridge replacement project, which could be finished ►

By The Numbers: CTfastrak

9.4 miles

Guideway length

11

Number of stations

16,000

Estimated riders per day by 2030

4:30–1:30 A.M.

Operational hours

\$1.50

Local cash fare

\$2.50

Express fare

SOURCE: CTFASTRAK.COM

► by 2020. The state is also working to repair other bridges like the Riverbend Rail Crossing in Stamford and upgrade the line's power supply to avoid outages.

Fixing current issues is essential, no doubt, but McGee and the Business Council of Fairfield County are advocating for new developments, like high speed trains that would get commuters from New Haven to New York in an hour. The DOT's response to this proposal was positive when

McGee met with Redeker in January.

Such improvements would help spur the economic and cultural shift that has already begun along the New Haven Line. Despite a statewide trend of young adults fleeing in favor of bigger cities, the popularity of the Metro-North recently has brought a younger cohort to towns like Norwalk and Stamford, many of whom are not wedded to cars as their parents were, preferring a predictable, low-

Riding Green

CTfastrak is promising a reduced environmental impact:

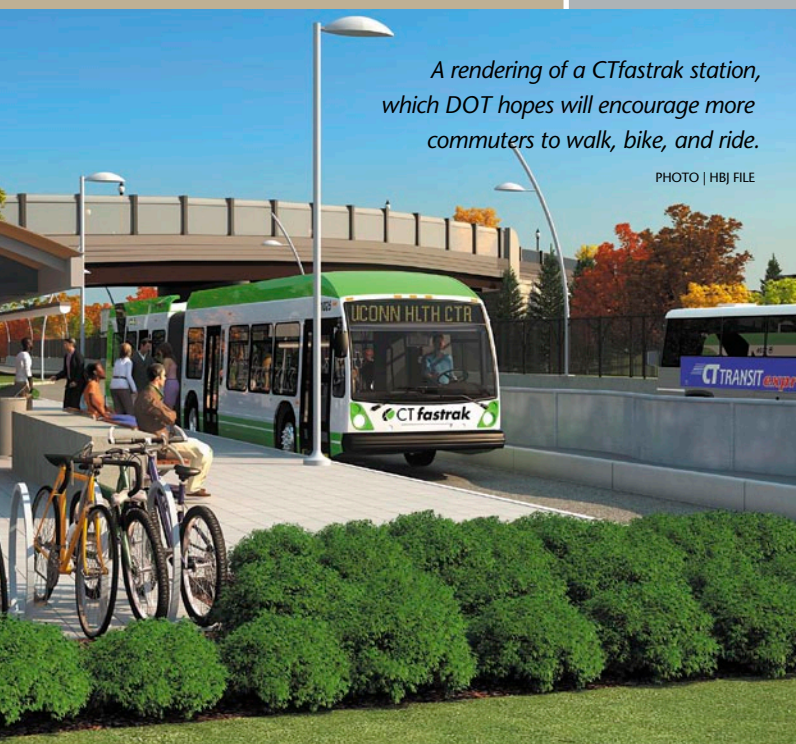
Air Quality: An estimated 30 percent of riders will be former auto users, resulting in 17 million fewer vehicle miles traveled. This reduction eliminates the production of 12,800 tons of carbon dioxide emissions

Water and Wetlands: The system uses drainage like grass-lined swales, water quality basins, and deep sump catch basins to filter

sediments and prevent pollutants from reaching nearby brooks, groundwater, and wetlands

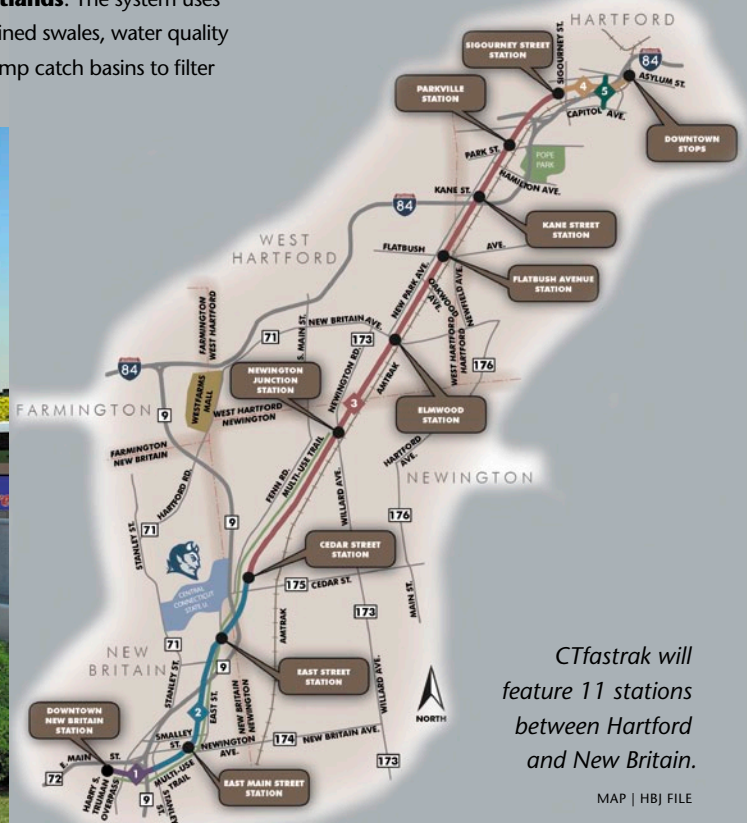
Sustainable Design: Stations include green features like photovoltaic solar panel systems, LED lighting, and bike racks

SOURCE: CTFASTRAK.COM



A rendering of a CTfastrak station, which DOT hopes will encourage more commuters to walk, bike, and ride.

PHOTO | HBJ FILE



CTfastrak will feature 11 stations between Hartford and New Britain.

MAP | HBJ FILE

cost commute, said McGee.

Indeed, more people are in search of an urban, community-based lifestyle with a smaller carbon footprint, said Sullivan.

"Connecticut has to offer that if we're going to compete," Sullivan said.

Central Connecticut will soon provide that option as well. DOT is in the early stages of constructing the \$365 million New Haven-Hartford-Springfield rail line. The service, also known as the Hartford

Line, will consist of both expanded Amtrak service and new regional trains operated by the DOT with about 25 daily trains running in each direction by 2030.

"You have to think about the future of the economy and not just be reactive," said Redeker. "I fundamentally believe in the power of rail and its ability to change the game."

The first stretch of the line is scheduled to begin running in late 2016, with new stations in West Hart-

ford, Newington, Enfield, and North Haven and upgraded stations in Berlin, Meriden, and Wallingford. These towns are already feeling the economic impact, with a surge of residential projects and new local businesses.

"To have an advantage going forward, we have to invest in transit to keep and attract talent. This investment has a long-term payoff, but it requires a long-term vision," said Sullivan "It's a critical piece in the state's future." ●



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Cut Solar's Cost

State, industry must address soft costs

By Michael Trahan

I recently met with representatives from a large West Coast solar electric installer business who are considering coming to Connecticut. Their reason for making an investment here?

"Connecticut's not a fledgling solar market anymore," they told me.

They're right. Home solar installs in Connecticut doubled two years ago, doubled last year, and are expected to double again this year even though state officials cut incentives for residential solar seven times in that span. Incentives for commercial solar are dropping, too. Installer companies are hiring again. We're headed in the right direction.

Connecticut electric ratepayer incentives have had a lot to do with the success of solar. Electric customers have put up millions to drive down solar costs. That's a serious investment. It pays off if demand for solar continues after state and federal incentives are phased out. What can be done to safeguard the ratepayer investment?

You start by cutting the cost to install solar.

Ten years ago, the cost for solar panels represented the largest percentage of the job. Thanks to ratepayer support, panel costs have dropped more than 50 percent. While panel prices have gone down, soft costs like permitting, inspections, connecting to the grid, and insurance have remained unchanged. Soft costs, not panels, now account for most of the price consumers pay to install a home solar system.

U.S. consumers' solar soft costs are four times higher than German consumers. The Germans are world leaders in the use of solar because they've cut installation costs. We can do the same.

Here's what the Connecticut solar industry is advocating for:

- Again this year we've asked state lawmakers to



Michael Trahan is the executive director of industry advocate Solar Connecticut.

cut the cost homeowners pay to have a solar system permitted. More than 30,000 Connecticut residential property owners are expected to install solar by 2020. Our proposal to streamline local permitting saves those homeowners \$15 — \$20 million.

- Last summer we made suggestions to the electric power companies on how to save homeowners money on the fee the companies charge to connect home solar systems to the electric grid. We're waiting for the electric companies to respond.

- The Connecticut Green Bank will soon receive installers' suggestions on how to create savings by reducing administrative paperwork, inspections, and other processes solar installers must follow to offer state incentives to their customers.

- State officials are interested in working with us to determine if there are ways to reduce Connecticut's outrageously high workers' compensation costs paid by solar installers and passed on to consumers.

These costing cutting measures, and others, can save residential solar users an estimated \$4,000 or more. Commercial property owners would save much more. 🌱



E-House Opening — The Connecticut Technical High School System opened the state's seventh E-House at Henry Abbott Technical High School in Danbury this December to be a high-school laboratory for learning green construction.

Pictured are Diana McCarthy-Bercury of Eversource Energy; Ron Araujo of Eversource; Dr. Nivea L. Torres, superintendent of the Connecticut Technical High School System; Congresswoman Elizabeth Esty (D-CT); Matthew Gibbs of Eversource; Natalia Sudyka of Eversource; State Rep. Dan Carter (R-Danbury); Samantha Sojka of Eversource; and David Kalafa of the Connecticut Department of Energy & Environmental Protection.



S. Windsor Campaign —

Eversource Energy promoted its Energize South Windsor campaign at the annual Conference for the Connecticut Council of Small Towns, showcasing how town residents can save money. Since the campaign's launch in July 2014, more than 370 South Windsor households have participated, qualifying the town for a \$10,000 grant.

Pictured are Samantha Sojka of Eversource; State Rep. Bill Aman (R-South Windsor); and Diana McCarthy-Bercury of Eversource.

The Green Guide ECOMMUNITY page recognizes special events and awards in the Connecticut sustainable business community. To submit an item, send photos and captions to: bkane@HartfordBusiness.com.

30% of energy consumed in commercial buildings is used unnecessarily or inefficiently — EPA, 2012

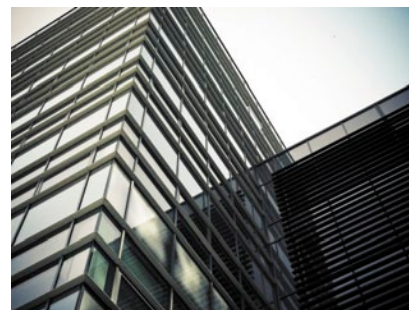
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The expected annual energy savings on the projects is \$422,000.



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EDITORIAL

PURA Should Stand On Its Own

A small, rare public spat between Connecticut regulators and elected officials popped up in January and yielded absolutely zero change.

The three commissioners of the Public Utilities Regulatory Authority — Jack Betkoski, Michael Caron, and Chairman Arthur House — wrote a letter to Gov. Dannel P. Malloy saying they wanted their own independent agency, so they could be free of any real or perceived influences as a result of being under the auspices of the Department of Energy & Environmental Protection.

Malloy's response amounted to, "If you don't like it, commissioners, then quit." PURA immediately backed off.

But the torch the commissioners were carrying shouldn't have extinguished there. They were making a reasonable, well-thought-out argument that should have gotten more respect from Malloy and the rest of the executive branch.

Having PURA be part of DEEP makes sense from an administrative cost standpoint, and creating a separate agency probably would result in more bureaucracy and more state employees, which is the last thing Connecticut needs. Still, a conflict of interest does arise when DEEP is a party to almost every major PURA case, and PURA reports to DEEP Commissioner Robert Klee, who reports directly to Malloy.

Looking over PURA's decision-making since it became part of



PURA holds regulatory authority over everything ranging from electric and natural gas utilities' rates to water companies to renewable energy designations.

PHOTO | HBJ FILE

DEEP in 2011, it is hard to say the commissioners have been influenced by Malloy's politics. They have dragged their feet on using submetering to pay for renewable energy systems, which Malloy called for in 2012. The recent decision to raise the basic connection fee for Eversource Energy's Connecticut electric ratepayers went against Malloy's and many other elected officials' wishes.

Still, this is only the current iteration of PURA. As new commissioners, new staff, new DEEP leaders, and new governors roll in and out over time, the agency's power structure always will have a hand in its decision-making. It wouldn't be a stretch to imagine PURA deteriorating into a situation like Office of Health Care Access, whose long list of politically charged restrictions against for-profit operators buying out nonprofit hospitals es-

entially killed a deal to have Texas operator Tenet Healthcare take over five Connecticut facilities.

There is a precedent for having stand-alone state regulatory agencies. The Connecticut Siting Council, which has the sole discretion to approve the locations of power plants and telecommunications infrastructure, makes its decisions independently of any executive branch department. Setting up a similar situation for PURA wouldn't be that difficult.

Ultimately, PURA is the place where the interests of businesses, residents, and politics all intersect. The agency must make complicated decisions equally based on how they influence considerations like utilities' ability to provide reliable energy, the ratepayers' pocketbook, and the precedent set for the future. Having those decisions made free of any political influence is an absolute must. 🍋

Renewable Payments

Solar owners should receive full value of power generated

By Jon Gordon

Many Connecticut electric customers have already taken the initiative to install renewable energy in their home or commercial facility, and many others are actively considering it, as the benefits can be considerable. It is important that the electric energy marketplace fully compensate these consumers who become electricity producers for the full value of the electricity they generate.

Given the intermittent nature of renewable power sources such as solar, at any given time a customer may be producing more or less electricity they consume. It is critically important to get compensation for renewable energy produced by these consumer/producers right, in order to continue to incentivize more and more customers to install distributed solar and other forms of renewable generation at their home or place of business. Finding that exact right compensation is a bit tricky, though.

Getting this right involves the complex and often arcane world of utility electric rates and metering practices which until recently never envisioned a distributed energy revolution where consumers of electricity become producers of electricity. Net metering is a means by which excess electricity produced by a renewable energy system at a customer location will spin the existing home or business electricity meter backwards, effectively banking the electricity until it is needed by the customer. This should provide the customer with full retail value for all the electricity produced, but in the complex deregulated energy world determining the appropriate full retail value is not always as simple as it might seem. It has become a controversial topic, but it is essential that Connecticut gets it right.

The solar industry would argue that these producers should be compensated at a rate equal to the amount paid by the ratepayer to the utilities for the electricity. The utilities would prefer to compensate these producers at a rate closer to the wholesale electricity rate, essentially what they pay power plants to supply electric-



Jon Gordon is an independent energy policy consultant and a 28-year veteran of the energy industry, working on issues ranging from power markets to regulation to legislative affairs. Gordon also serves on the Board of REEBA (Renewable Energy and Efficiency Business Association).

ity onto the grid, which is about a two-thirds lower than what ratepayers end up paying. The truth, which should be determined by regulators after input from the industry and the utilities, lies somewhere in-between.

It is critical that Connecticut policymakers and the Connecticut Public Utilities Regulatory Authority implement policy and oversees electric utility rates and metering practices, ensure that consumers are both appropriately incentivized with enabling metering practices, and fairly compensated for the renewable electricity they produce. Connecticut policymakers and regulators need to stay ahead of technological advancements in distributed renewable generation with enabling policies that encourage continued innovation and rapid deployment of solar. ●

Gasified Biomass

Engel Power

FOUNDER: Thomas Engel

EMPLOYEES: 1

LAUNCH: July 2014

HEADQUARTERS: East Hampton

WEB SITE: Under development

Starting Up

Engel is developing a circular gasifier that thermally converts biomass into gases like hydrogen and carbon monoxide to power an electric generator. Engel received a \$10,000 Entrepreneur Innovation grant from Connecticut Innovation to develop the system's controller.

Save Money

A 20-kilowatt Engel generator will cost between \$80,000 and \$100,000, which is \$4-6 per watt generated. Although this is more expensive than grid power, Engel said it is a viable alternative to solar panels for renewable energy generation, since his gasifier can generate electricity constantly.

Save the Environment

Engel plans on marketing the product to businesses with biomass waste like farms and pallet manufacturers, along with cities with tree-cutting waste. The generator turns that waste into a fuel and the only waste products are water and carbon dioxide.

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